

Destination L1: A Thematic Unit

Capturing a Whisper

STUDENT TEXT

BACKGROUND INFORMATION

Think about all of the missions that have launched a spacecraft into orbit in our solar system. Some of them are manned missions; the rest are unmanned. We know that when a mission is manned, astronauts have a means of communicating from the spacecraft to ground control. But what about all of the missions that are unmanned? How do we monitor them? How do we know if they are on course? How do we know if the mission is progressing as it should, collecting the necessary science data, and staying on schedule?



Deep Space Network

Canberra Deep Space Communication Complex, Fyshwick, Australia

The National Aeronautics and Space Administration (NASA) Deep Space Network (DSN) is an international network of antennas that supports interplanetary spacecraft missions. The DSN provides the means of communicating with robotic spacecraft exploring the solar system and beyond. They conduct radio and radar astronomy observations for the exploration of the solar system and the universe. The network is managed and operated by the Jet Propulsion Laboratory. The DSN is used for all space missions and is the largest and most sensitive scientific telecommunications system in the world. Three locations currently make up the network, including: Goldstone in California’s Mojave Desert; Madrid, Spain; and Canberra, Australia. These facilities are approximately 120 degrees apart on the globe. The placement of the network in these locations allows constant observation as the Earth rotates.

Signals must travel millions or billions of kilometers between Earth and the spacecraft in order to communicate. Yet, in order to make a spacecraft as light as possible, instruments, including communications equipment, must be small and light. The result is that the spacecraft communications received by the DSN often could be characterized as a whisper. In order for DSN to “hear” this whisper from a craft out in space, the antennas that receive signals must be quite large and have highly sensitive receivers on them. Does DSN only listen to spacecraft? No. Actually, DSN talks to them as well. High-powered transmitters send commands from the DSN to the spacecraft to turn on computers, activate instruments, and make course corrections. Bingo. We have a means to monitor spacecraft, control their course, and listen to them to determine if there are issues that need to be resolved.

The Wilderness, by Ray Bradbury, is a science fiction short story that uses a long-distance (60 million miles of distance!) network of communication—the light phone. We get glimpses of how the phone works as the story unfolds. “Janice had the receiver up....And the operator in a far city was readying the immense apparatus which would tie two worlds together....” Each speaker had one minute of time to record their message, after which the words were sent “...to space, they belonged to no one until they arrived, and they were traveling at one hundred and eighty-six thousand miles a second to their destination.”

Is our present DSN an early light phone? To learn more about the Deep Space Network, visit the Web site at: <http://deepspace.jpl.nasa.gov/dsn/>